

REMARKS

These remarks are in response to the final Office Action mailed on March 1, 2002, and for which a three-month extension is hereby requested. In the Office Action, all of the pending claims were rejected under 35 U.S.C. 103(a) based on the reference of Iijima, U.S. Patent No. 5,349, 649. It is believed that the invention of the present application differs in a number of significant ways from what is presented in the Iijima reference and is not obvious from Iijima. Although all of the formerly pending claims are believed allowable as is discussed briefly below, they have been cancelled and a new set of claims drawn to specifically highlight the various aspects of the present invention that are distinct from the prior art are being submitted. Consequently, the present amendment is being filed with a Request for Continued Examination (RCE). Additionally, the Applicants thank the Examiner for the telephonic interview of August 21, 2002, when the differences between the present application and the cited prior art, particularly Iijima and also Users Manual for the SupraExpress 288, were discussed.

The present remarks begin with a discussion of the Iijima patent and then a discussion of the present application and how it differs from Iijima. This is followed by a discussion of the new claims, a discussion of the new figure and, finally, a discussion of the previous claim rejections.

Iijima, U.S. Patent No. 5,349, 649

The Iijima patent describes a method for communication when a host and card can use two different protocols (A, B) to communicate. This is described there with respect to Figures 2A to 5. Figures 2A and 2B describe operations within the card, Figure 3 describes the process in the host.

The process begins with step ST1 in Figure 2A, with YES = "card 1 supports only protocol A or B [that is, *one of either A or B, but not both*] (to be referred to as case 1)" and goes on to step ST2 (column 3, lines 1-5), and with NO = "protocol A or B can be designated [actively chosen] by an external device (to be referred to as case 2 hereinafter)" and goes to step ST14 in Figure 2B (column 3, lines 6-12).

Figure 2B corresponds to the more relevant case here (where the card supports two protocols), with Figure 2A as the single protocol case. In either case, the process then proceeds as described at column 3, lines 22-30:

"Prior to data communication, a reset signal is supplied from external device 7 to CPU 4 [of card]. When this reset signal is disabled, initial data called "Answer to Reset" (ANS-TO-RESET) is output from CPU 4 in IC card to external device 7. The "Answer to Reset" information includes data defining the type of communication protocol supported by IC card 1. External device 7 receives "Answer to Reset" information and checks the communication protocol used with IC card 1..."

In step ST2/ST14, the card determines how to respond to the "Answer to Reset" by indicating to the host in which of protocol A or B the card communicates, this being determined by the card based on a value stored in the cards memory (column 4, lines 9-24 and 51-57). This information is then communicated to the host in a form that the host can understand (column 3, lines 28-31).

The "Answer to Reset" is transmitted from the card to host in step ST3/ST6/ST15/ST21. That is, the card tells the host which of protocols A and B it can support as determined by the card in step ST2/ST14 using a third, standardized protocol in which both the host and card can communicate (column 3, lines 32-37; column 4, lines 17-24 and 58-68). This "Answer to Reset" is then received at the host and the process there is described with respect to Figure 3 (column 3, line 32, to column 4, line 2).

In step ST201 the card tells host what protocol it can support (column 3, lines 34-41). In step ST202 the host decides if the card will support the host's protocol based on the "Answer to Reset" sent in a language both the host and card can use for this initial communication (column 3, lines 42-46). In step ST203, based on the "Answer to Reset", the host must actively chose the protocol the card will use by outputting information for selecting the protocol the card will use (if card supports more than one and one of these is the host, otherwise error ST205) (column 3, lines 47-59). Thus the host selects its own protocol in a process that requires an active choice by host---and it is a choice only in a limited sense, in that the host either confirms the cards initial choice of protocol as OK or else the host rewrites the chosen protocol stored in the cards memory.

Returning to the card's side of the process, this goes back to step ST4/ST7 in Figure 2A, for the case where the card supports only a single protocol, or step ST17/ST23 in Figure 2B, for the case where the card supports both protocols. In Figure 2A, as the card supports only one protocol, either it supports host's protocol or doesn't, in which case an error. In the case of Figure 2B, the host sends a protocol type select signal (PTS) (column 3, line 60, to column 4, line 2): "Each external device 7 automatically switches and selects one of the protocols from the IC card 1 which supports multi-protocols." This protocol type select signal

arrives in steps ST17/ST23 (column 5, lines 1-11) and is checked in step ST18/ST24 (column 5, lines 12). In step ST18/ST24, the host says to the card either, "your protocol is OK" (the NO path) or "I don't like your protocol and you need to switch it" (the YES path) in steps ST19/ST25.

In response to the YES in step ST19/ST25, the host tells the card to reset the preferred protocol in step ST16/ST22, which had formerly been assumed based on the card's previous history. Only at this point is the card ready to receive commands in the host's protocol, step ST5/ST8/ST20/ST26, that are sent in step ST204 of Figure 3.

Thus, Iijima presents two variations. In the first, of Figure 2A, the card only supports one protocol (only one of A and B) which is determined by the card itself. Thus, the card does not rely on the host for the selection as the host either accepts the card's protocol or it doesn't work. (The card has two protocols and cannot switch by itself, so that the host must use the card's chosen protocol; although there is a provision for the host to change the card's default protocol as described at column 6, lines 53-61, this can only occur after communication has been established using the card's chosen protocol.) In the second case of Figure 2B, the card can support two protocols, A and B. In either case (Figure 2A or 2B) the host can order the card to switch between A and B, but must first respond in the card's chosen protocol. In both cases, the card decides in which protocol to start communication.

In the device of Iijima, the card always starts up in a predetermined way and the host either accepts or does not accept. The card starts communicating and the host can either listen or not---if it can, the card happened to start in the correct protocol. If the card supports two protocols, the host can change the protocol the card uses, but the card can not change this protocol itself.

Present Application

A major aspect of the invention of the present application is also the use of a memory card with a host that may be operating in one of several protocols. However, the present invention presents a process that is believed to be quite distinct and non-obvious from the prior art, including Iijima.

In the exemplary embodiment of the present invention, the two protocols are MultiMediaCard (MMC) protocol and Serial Peripheral Interface (SPI) protocol. As described in the application, the SPI protocol is technically a physical communication protocol, while MMC is a complete protocol, both physical and logical. As the SPI protocol

is only a physical protocol, the logical format used for the SPI case in the exemplary embodiment is modeled on the MMC case. In particular, as described at page 6, lines 15-26, both protocols in the preferred embodiment accept the same first reset command after power up as CMD0 as defined in the application.

The connections of the cards to a host for the MMC case are shown in Figure 1 and for the SPI case in Figure 3. The card structure is shown in Figure 2 and the functions of the pins in the two exemplary protocols are shown in Figure 4.

The mode selection process is primarily described in the present application between page 6, line 28, and page 8, line 25, of the present application (as amended):

--In a preferred embodiment according to the present invention, every card wakes up in the MultiMediaCard mode. If the host intends to communicate with the card(s) connected in the Serial Peripheral Interface mode, then the host begins the normal Serial Peripheral Interface mode initialization procedure by sending (903, Fig. 9) a reset command (CMD0) in the command line CMD or the DataIn line and asserting the CS signal of each card connected to the host. When the CS signal in the communication bus is asserted (negative) by the host during the reception (905, Fig. 9) of the reset command (CMD0) ("YES" 907, Fig. 9), each of the cards in the system will enter the Serial Peripheral Interface mode. All the subsequent communications between the host and the card(s) will then be performed under the Serial Peripheral Interface protocol (923, Fig. 9).

On the other hand, if the host is designed to communicate with the card(s) connected in the MultiMediaCard mode, the above-mentioned Serial Peripheral Interface initialization step (i.e. sending a reset command in the command line CMD or the DataIn line and asserting the CS signal of each card connected to the host) will not be performed ("NO" 907, Fig. 9). However, in the preferred embodiment of the present invention, each card is designed to wake up in the MultiMediaCard mode if it is not set otherwise. Thus, in the present case, the card will remain in the MultiMediaCard mode (911, Fig. 9) and will only accept and respond to MultiMediaCard commands issued by the host. All communications between the host and the card(s), in this case, will be performed under the Multi-Media Card protocol (913, Fig. 9).

Particularly, by performing the mode selection in the card(s) only, the entire mode selection is transparent to the host (911, 921, Fig. 9). In other words, the card of the present invention is able to adapt its communication protocol to hosts running in either mode (i.e. Serial Peripheral Interface mode and MultiMediaCard mode).--

For example, the card of the present invention can attach to a MultiMediaCard host for downloading data from the MultiMediaCard host to the card. Then, the card can be removed to a Serial Peripheral Interface host for uploading the stored data from the card to the Serial Peripheral Interface host. The entire process will be transparent to either the MultiMediaCard host or the Serial Peripheral Interface host. Thus each of the two hosts treats the card of the present invention as a card designed solely for its corresponding protocol (e.g. MultiMediaCard mode for the MultiMediaCard host, or Serial

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Peripheral Interface mode for the Serial Peripheral Interface host). This feature provides tremendous benefits in the portability of data to different systems.

Figure 4 shows the pin assignment of a card of the preferred embodiment of the present invention designed to operate in either the MultiMediaCard mode or the Serial Peripheral Interface mode.

When the card is operating under the Serial Peripheral Interface mode, pin number one is assigned as the chip select, and pin numbers 2, 4, 5, and 7 are assigned as DataIn, Vdd, CLK, and DataOut respectively. In addition, pin numbers 3 and 6 are assigned as voltage ground.

On the other hand, when the card is operating under the MultiMediaCard mode, pin number one is not used, and pin numbers 2, 4, 5, and 7 are assigned as command CMD, Vdd, CL, and DAT respectively. In addition, pin numbers 3 and 6 are assigned as voltage ground. It should be noted that pin 1 is not used in the MultiMediaCard mode.

In this preferred embodiment, the Serial Peripheral Interface protocol defines the physical link of the communications between the host and the cards only. The internal memory storage of the card remains identical. In other words, only the card communication protocol is changed to either the MultiMediaCard mode or the Serial Peripheral Interface mode depending on the host connected.

From the application point of view, the advantage of the Serial Peripheral Interface mode is the capability of using an off-the-shelf host using the same card. The flexibility reduces the design-in effort to minimum. The disadvantage is the loss of performance of the Serial Peripheral Interface system versus MultiMediaCard (lower data transfer rate, fewer cards, hardware CS per card etc.).

This passage has been quoted at length as it illustrates both how the present invention operates and how it differs from the process described above for Iijima. Additionally, it is referred to below in the discussion of the newly added figure.

More briefly, the process of the present invention consists of attaching the card to a running host in a protocol; the host detects the card and sends an initial reset signal in the host's own protocol; in response to reset signal, the card selects the host's protocol based only on this initial reset in a way that is entirely transparent to the host. As seen from the host, there is no indication that the card operates in anything but the same protocol as the host. Furthermore, there is no need for an ISO standardized protocol for initial communication.

The process of the present invention can be contrasted with that of Iijima. In both the present invention and the process of Iijima, a host that runs in a particular protocol has a card connected. The host then sends a reset signal to the card. After this, the two processes diverge: In the present invention, the card selects the hosts protocol based on this reset signal and is ready to receive commands from the host in its protocol at this point, all in a way transparent to the host.

In contrast, Iijima has a number of additional steps necessary before it can receive commands in the hosts protocol. Considering the more relevant case of Figure 2B where the card supports two protocols, subsequent to the receiving the reset signal, the card must send back to the host a signal ("Answer to Reset", ST15/21) specifying the protocol the card has determined it prefers and which protocols it supports (ST14), the card having also previously determined that it supports two protocols in step ST1. While the card waits (ST17/ST23), the host receives the "Answer to Rest" (ST201), determines if the card has told the host that the card supports the host's protocol (ST202) and, if the host needs the non-default protocol, sends a signal (Protocol Select Signal or PTS) back to the card telling the card to switch protocols before transferring data and commands (ST204). Back at the card, the card checks if there is PTS data (ST18/ST24) and decides (ST19/ST25) whether the host is happy with the cards choice of protocol and, if not, switches the cards current protocol (ST16/ST22). Only at this stage is the card switched into the protocol the host is using to transfer data and commands to the card.

Further, it appears unlikely that the process of Iijima would function with multiple cards attached, as described in the present application with respect to Figures 1 and 3 as there is no assurance that all attached cards would be operating in the protocol switching mode of Iijima's Figure 2B. For example, consider the case where a second card is attached to the host/card system of Iijima when a first card is already running.

Therefore, Iijima does not have the card choose the protocol, this choice is not in response to the initial reset received at the card from the host, and is not made in a manner transparent to the host. Rather, Iijima teaches away from such a process, having the host choose the protocol, actively selecting it in through a series of signal exchanged back and forth between the host and card in an additional protocol. Thus, it is respectfully submitted that the invention of the present application is quite distinct and non-obvious from what is presented in Iijima. This is reflected in the claims.

The Examiner has previously introduced the Users Manual for the SupraExpress 288 in the Response to Arguments as support for claim rejections under 35 U.S.C. 103. However, the communication method used by this reference is protocol negotiation. The initiating device initiates communication using a user selectable protocol, the remote device responds using its own choice and the two devices continue trying to communicate using local rules to select from a predetermined list of allowable protocols until communication is possible, or break the connection and try to communicate using the same procedure at a later time. This is

clearly different than the present invention where the protocol selection is transparent to the host, in which no negotiation occurs, and communication is always possible as long as the host protocol is contained within the card's allowed list of protocols. Thus, the Users Manual for the SupraExpress 288 again teaches away from the present invention as embodied in the pending claims.

New Claims

In order to more clearly delineate these distinctions between the mode select process of the present application and those of the prior art, including Iijima, a set of new claims have been filed. More specifically, claim 91 has that "based on signals from the host the ... card selects the [host's] protocol from a plurality of protocols in a way transparent to the host", with claims 87, 92, and 97 drawn to the exemplary embodiment where this selection is made based on the initial reset signal from the host. As described above, this is quite distinct and non-obvious from the teachings of Iijima where, in response to the reset, the card must respond to the host with information on what protocol the card favors ("Answer to Reset") and the host has to determine if it is happy with the card's choice and change the card's choice if the host wants a different protocol (PTS data). This is also very different from the process of the Users Manual for the SupraExpress 288, where the protocol selection is neither transparent to the host nor based on the signals from the host.

Claims 88, 93, 98, and 99 are drawn to the exemplary embodiments of the structure of the reset command and card interface. Claims 89, 90, 94, 95, 100, and 101 specify exemplary protocols with which the present invention can be used. Claims 96 and 103 note that the present invention readily extends to the use of multiple cards with a given host, while claim 102 describes the use of a single card with multiple hosts having distinct protocols.

Comments on Previous Office Actions

As noted above, although the previously pending claims have been cancelled, they are believed allowable over the prior art for the reasons stated above with respect to the new claims. These distinctions have been discussed in previous responses and will not be repeated here as these claims have now been cancelled in favor of the new set of claims drawn to specifically highlight the various aspects of the present invention that are distinct from the prior art. In addition to distinctions noted above, namely that the claims are not only not obvious based upon the Iijima reference, but, rather, that this reference rather teaches away

from the present invention as embodied in these claims, it respectfully submitted that the Office Action makes several other errors.

It is respectfully submitted that the Office Action has made a number of improper comments related to rejections under 35 U.S.C. 103(a) based upon only a single reference and the taking of "Official Notice". In a number of places the Office Action admits that claims recite features lacking in the reference, yet there is no further reference or other evidence of prior art presented to demonstrate that the overall claimed combinations including the elements missing from Iijima would have been obvious. The Office Action either summarily states that "it would have been obvious" to add the missing element in order to meet the terms of the claims, or "Official Notice" is taken that the elements missing were well known and would have been obvious to include in the claimed combinations. In either case, assumptions have improperly been made by the Examiner as to what one ordinarily skilled in the art would have found obvious to do since there is no supporting evidence provided in the Office Action. It is respectfully submitted that these rejections do not make the necessary *prima facie* case of obviousness. For example, the Office Action states that the MMC protocol was well know at the time without any supporting evidence.

The Office Action also states that a number of things are obvious based upon Iijima when, as is described above, it is respectfully submitted that Iijima instead teaches away from the present invention and that any claims of obviousness are improperly made based upon hindsight gained from the present application.

It is also respectfully submitted that the claims are fully supported by the present application in both its specification and its figures. Although further details related to the present invention are presented in the MultiMediaCard specification, there is no reliance upon this document for essential material. More specifically, Figures 1 and 3 show the connection of cards to host for the MMC and SPI case, respectively, with the bus for data and commands shown in both and a chip select line in the SPI case. Figure 2 shows the structure of the card with the pin connections and interface driver, including the commands shown in Figure 4, including CMD (of which CMD0 is an example) at pin 2 and chip select at pin 1.

All through the features of the currently pending claims are believed to either be shown in or inherent from Figures 1-8 of the application, the present Amendment is adding Figure 9 in order to facilitate the application process. The contents of this figure are all contained in the extended portion of the present application found between page 6, line 18, and page 8, line 25, of the application that is quoted at length above and to which

corresponding reference numbers have been added. The new figure places these various steps in a flow as described in this passage of the application. Consequently, this does not constitute the introduction of new matter. Additionally, an appropriate corresponding reference to Figure 9 has been added to the "Brief Description of the Drawings" section of the specification.

Conclusion

For any of these reasons, claims 87-103 are believed allowable. Consideration of these claims is therefore respectfully requested and an early indication of their allowability is earnestly solicited.

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Respectfully submitted,



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APPENDIX

Amended Portion of Specification:

Please replace the three paragraphs beginning on page 6, line 28, and ending on page 7, line 18:

--In a preferred embodiment according to the present invention, every card wakes up in the MultiMediaCard mode. If the host intends to communicate with the card(s) connected in the Serial Peripheral Interface mode, then the host begins the normal Serial Peripheral Interface mode initialization procedure by sending (903, Fig. 9) a reset command (CMD0) in the command line CMD or the DataIn line and asserting the CS signal of each card connected to the host. When the CS signal in the communication bus is asserted (negative) by the host during the reception (905, Fig. 9) of the reset command (CMD0) ("YES" 907, Fig. 9), each of the cards in the system will enter the Serial Peripheral Interface mode. All the subsequent communications between the host and the card(s) will then be performed under the Serial Peripheral Interface protocol (923, Fig. 9).

On the other hand, if the host is designed to communicate with the card(s) connected in the MultiMediaCard mode, the above-mentioned Serial Peripheral Interface initialization step (i.e. sending a reset command in the command line CMD or the DataIn line and asserting the CS signal of each card connected to the host) will not be performed ("NO" 907, Fig. 9). However, in the preferred embodiment of the present invention, each card is designed to wake up in the MultiMediaCard mode if it is not set otherwise. Thus, in the present case, the card will remain in the MultiMediaCard mode (911, Fig. 9) and will only accept and respond to MultiMediaCard commands issued by the host. All communications between the host and the card(s), in this case, will be performed under the Multi-Media Card protocol (913, Fig. 9).

Particularly, by performing the mode selection in the card(s) only, the entire mode selection is transparent to the host (911, 921, Fig. 9). In other words, the card of the present invention is able to adapt its communication protocol to hosts running in either mode (i.e. Serial Peripheral Interface mode and MultiMediaCard mode).--

Pending Claims

(Claims 1-86 have been cancelled)

87. A memory card connectable to a master operating in a first communication protocol, comprising:

an interface for connection to the master for the transfer of data and commands between the host and the memory card;

a memory section for storing said data; and

an interface controller connected to the memory section and the interface, wherein the interface controller selects said first communication protocol from a plurality of protocols based solely on an initial reset signal received from the master upon connection to the master.

88. The memory card of claim 87, wherein the interface comprises a plurality of connection pins and wherein said initial reset command comprises asserting a first signal level to a first connection pins when the host operates in the first protocol and not asserting said the first signal level to the first connection pins when the host does not operate in the first protocol.

89. The memory card of claim 88, wherein said asserting a first signal level is the assertion of a chip select signal and wherein the first protocol is a Serial Peripheral Interface protocol.

90. The memory card of claim 88, wherein the first protocol is a MultiMediaCard protocol.

91. A system comprising:

a host that operates in a first communication protocol; and

a first card connectable to the host for transferring data and commands between the first card and the host, wherein based on signals from the host the first card selects the first protocol from a plurality of protocols in a way transparent to the host.

92. The system of claim 91, wherein the first card selects the first protocol in response to an initial signal from the host when the first card is connected to the host.

93. The system of claim 92, wherein the first card comprises an interface through which the data and commands are transferred, the interface comprising a pin, and

wherein the reset signal comprises asserting a signal to said pin that is dependent upon said first protocol.

94. The system of claim 93, wherein said first protocol is a Serial Peripheral Interface protocol and said signal is a chip select signal.

95. The system of claim 93, wherein said first protocol is a MultiMediaCard protocol.

96. The system of claim 91, further comprising:
a second card connectable to the host simultaneously with the first card for transferring data and commands between the second card and the host, wherein the second card selects the first protocol from a plurality of protocols in a way transparent to the host.

97. A method comprising:
connecting a first memory card capable of communicating in a plurality of communication protocols to a first host operating in a first of said plurality of communication protocols;
in response to said connecting the first memory card to the first host, transmitting a reset command from the first host to the first card;
receiving the reset command in the first card; and
the first memory card selecting the first communication protocol for the transfer of data and commands between the first host and the first memory card based solely on the reset command.

98. The method of claim 97, wherein said reset command comprises asserting a chip select signal.

99. The method of claim 98, wherein the first card subsequently remains in said first protocol when the chip select signal is de-asserted.

100. The method of claim 98, wherein the first communication protocol is a Serial Peripheral Interface protocol.

101. The method of claim 97, wherein the first communication protocol is a MultiMediaCard protocol.

102. The method of claim 97, further comprising:
transferring first data from the first host to the first memory card using the first communication protocol;
disconnecting the first memory card from the first host;
connecting the first memory card to a second host operating in a second of said plurality of communication protocols;
in response to said connecting the first memory card to the second host, transmitting a reset command from the second host to the first card;
receiving the reset command from the second host in the first card;
the first memory card selecting the second communication protocol for the transfer of data and commands between the second host and the first memory card based solely on the reset command from the second host; and
transferring the first data from the first memory card to the second host using the second communication protocol.

103. The method of claim 97, further comprising:
connecting a second memory card capable of communicating in the plurality of communication protocols to the first host while the first memory card is also attached to the first host;
in response to said connecting the second memory card to the first host, transmitting a reset command from the first host to the second card;
receiving the reset command in the second card; and
the second memory card selecting the first communication protocol for the transfer of data and commands between the first host and the second memory card based solely on the reset command.